



**ORIGINAL ARTICLE**

# Thyroglossal cyst: Brazilian panorama

Ricardo Vieira Teles Filho<sup>1\*</sup> 

## Abstract

**Introduction:** Thyroglossal duct cyst (TDC) is the most commonly found cervical congenital mass, occurring in approximately 7% of the population; however, data on TDC in Brazil are scarce. **Objective:** To outline the Brazilian scenario in the treatment of TDC and review the literature on this theme. **Methods:** Retrospective epidemiological study with a descriptive approach using secondary data collected from the SIH/DataSUS (*Sistema de Internações Hospitalares/Sistema Nacional de Informação em Saúde*) between 2008 and 2018, along with an analysis of the revisions on TDC published over the past ten years. **Results:** Between 2008 and 2018, there were 23,602 hospital admissions for TDC excision, with an average of 2,145 procedures per year, resulting in an average of 11.85 procedures per 100,000 inhabitants in the period evaluated. Admissions occurred predominantly in the Southeast and Northeast regions, at an average cost of BRL 1,054,977.66 per year to the health system of the country. The literature search resulted in 52 review articles addressing the pathogenesis, diagnosis and management of TDC, which are explained in this study. **Conclusion:** TDC is a congenital entity predominantly treated in the country at relevant costs to the health system, demanding accuracy on the knowledge of its pathogenesis for better diagnosis and management of patients with this condition.

**Keywords:** thyroglossal cyst; cervical cysts; congenital malformations.

<sup>1</sup>Universidade Federal de Goiás (UFG), Faculdade de Medicina, Departamento de Cirurgia, Goiânia, GO, Brasil

**Financial support:** None.

**Conflicts of interest:** No conflicts of interest declared concerning the publication of this article.

**Submitted:** September 30, 2019.

**Accepted:** November 17, 2019.

The study was carried out at Faculdade de Medicina, Departamento de Cirurgia, Universidade Federal de Goiás (UFG), Goiânia, GO, Brasil.

## Introduction

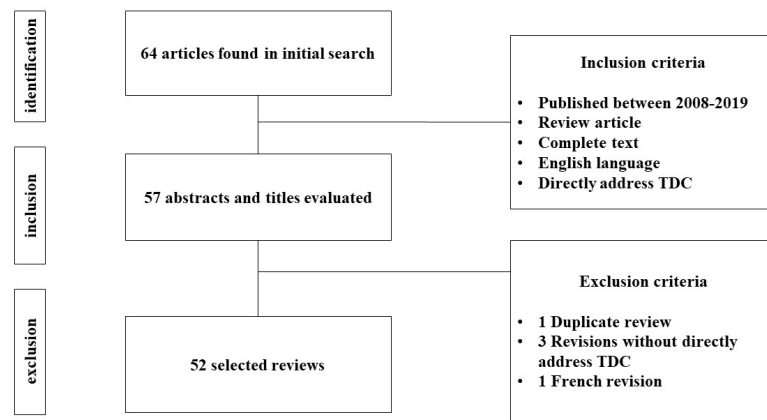
Thyroglossal cyst (TDC) is considered a relatively rare condition with low incidence in the general population, however, it stands out as the main anomaly occurring due to incomplete obliteration of the thyroglossal duct. It is the most common congenital malformation of the neck, and thus the main differential diagnosis of cervical masses evaluated in childhood. National data on the number of procedures and treatment costs for this condition are scarce, thus hindering an outline of its prevalence. Aiming at a more accurate diagnosis and thus proceeding with the best propaedeutic, it is necessary to know the embryology and defects of the thyroglossal duct obliteration and its variants, as well as the anatomical features that delimit the area of its formation, comprising the main differential diagnoses involving anterior cervical masses; subsequently indicating the most appropriate imaging examinations to complement the investigation<sup>1,2</sup>. To this end, an analysis of the Brazilian panorama regarding the data on the treatment for TDC was conducted, as well as a review of the current literature addressing the theme with a focus on its pathogenesis, diagnosis and treatment.



Copyright Teles Filho This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### Methods

This is a cross-sectional study conducted with secondary data from the SIH/DataSUS (*Sistema de Informações Hospitalares/Sistema Nacional de Informação em Saúde*). Data from all hospitalizations for TDC treatment in Brazil were collected between 2008 and 2018. The term used as search parameter was that in the SUS code for the treatment: 0401020096 - THYROGLOSSAL DUCT CYST EXCISION. The variables were analyzed by year and included: number of hospitalizations, average cost per hospitalization, total cost of hospitalizations, hospital length of stay, number of deaths, and mortality rates. Descriptive analysis of the data consisted of frequency distribution of the variables and construction of mean and proportion indicators. Simultaneously, a review of the literature in English on the theme was conducted for the 2008-2019 period on studies addressing TDC published at the PubMed database using the search term “thyroglossal cyst”. Overall, 64 articles were found, and after application of the inclusion and exclusion criteria (Figure 1), 52 articles were selected for this review (Table 1).



**Figure 1.** Organization chart describing the research strategy for the literature review that resulted in the 52 selected review articles.

**Table 1.** Studies selected for the review.

Author	Year	Country
Rosenberg et al. <sup>3</sup>	2010	USA
Friedman and John <sup>4</sup>	2011	USA
Ibrahim et al. <sup>5</sup>	2011	USA
Salgarelli et al. <sup>6</sup>	2011	Italy
Sameer et al. <sup>7</sup>	2012	India
Catania et al. <sup>8</sup>	2012	Italy
Chou et al. <sup>9</sup>	2012	Grenada
Gallagher and Hartnick <sup>10</sup>	2012	USA
Agarwal and Kanekar <sup>11</sup>	2012	USA

**Table 1.** Continued...

Author	Year	Country
Goins and Beasley <sup>12</sup>	2012	USA
Kim and Chung <sup>13</sup>	2012	South Korea
Bando et al. <sup>14</sup>	2012	Japan
Altay et al. <sup>15</sup>	2012	Turkey
LaRiviere and Waldhausen <sup>16</sup>	2012	USA
Edwards et al. <sup>17</sup>	2013	USA
Pfeiffer et al. <sup>18</sup>	2013	USA
Choi et al. <sup>19</sup>	2013	South Korea
Safiruddin et al. <sup>20</sup>	2014	The Netherlands
Curtis and Edwards <sup>21</sup>	2014	USA
Zander and Smoker <sup>22</sup>	2014	USA
Gaddikeri et al. <sup>23</sup>	2014	USA
Carter et al. <sup>24</sup>	2014	USA
Kim <sup>25</sup>	2014	South Korea
Rohof et al. <sup>26</sup>	2014	The Netherlands.
Oomen et al. <sup>2</sup>	2015	The Netherlands
Ibrahim et al. <sup>27</sup>	2015	USA
Huang et al. <sup>28</sup>	2015	China
Hills and Maddalozzo <sup>29</sup>	2015	USA
LaPlante et al. <sup>30</sup>	2015	USA
Gioacchini et al. <sup>31</sup>	2015	Italy
Chala et al. <sup>32</sup>	2015	Spain
Hong et al. <sup>33</sup>	2015	South Korea
Shah et al. <sup>34</sup>	2015	USA
Bakkar et al. <sup>35</sup>	2016	Italy
Ho et al. <sup>36</sup>	2016	USA
Brown and Harave <sup>37</sup>	2016	UK
Christison-Lagay <sup>38</sup>	2016	USA
Sturniolo et al. <sup>39</sup>	2016	Italy
Thompson <sup>40</sup>	2017	USA
Nightingale <sup>41</sup>	2017	Australia
Thompson et al. <sup>42</sup>	2017	USA
Frank et al. <sup>43</sup>	2017	USA
Rayess et al. <sup>44</sup>	2017	USA
Alatsakis et al. <sup>45</sup>	2018	Greece

**Table 1.** Continued...

Author	Year	Country
Bansal et al. <sup>46</sup>	2018	USA
Quintanilla-Dieck and Penn <sup>47</sup>	2018	USA
Patel and Bhatt <sup>48</sup>	2019	USA
Hosokawa et al. <sup>49</sup>	2019	Japan
Amos and Shermetaro <sup>1</sup>	2019	USA
Korbi et al. <sup>50</sup>	2019	Tunisia

## Results

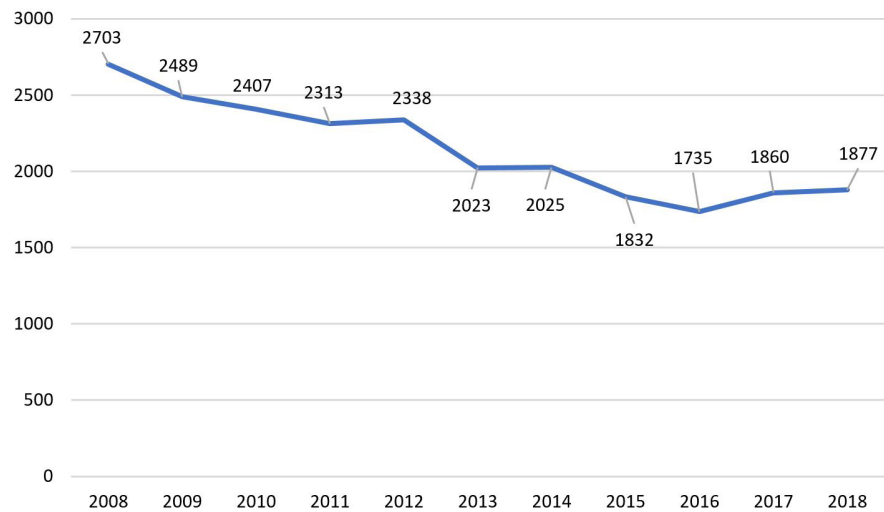
### Epidemiology

Thyroglossal duct cyst (TDC) is the most common congenital malformation of the neck, representing 70% of all congenital cervical lesions, and despite of being the most common pediatric cervical mass, it also occurs in the adult population, with variable frequency. Studies have indicated that the overall mean prevalence of TDC in the population is 7%, being found in approximately 5-10% of the autopsy examinations performed; most cases remain asymptomatic until diagnosis<sup>30,31</sup>. Gender prevalence is approximately the same; however, diagnosis tends to be predominant in male pediatric patients and female adult patients. There is no ethnic or geographic preference. Two-thirds of the patients with TDC are diagnosed before the age of 30, and over 50% of these can be clinically observed before age 10, and are usually diagnosed at the mean age of five years<sup>1,47</sup>.

### Brazilian panorama

In Brazil, there were 23,602 hospitalizations for TDC excision between January 2008 and December 2018, with an average of 2,145 procedures performed per year; with the largest number of procedures performed in 2008 (2,703) and the lowest in 2016 (1,735), according to the SIH-DataSUS (Figure 2). Considering the growth of the Brazilian population for this period (2008-2018), according to data from the Brazilian Institute of Geography and Statistics (IBGE)<sup>51</sup>, there was a constant annual growth rate close to 0.9%, thus, the average number of TDC excision was 11.85 per 100,000 inhabitants in the period evaluated.

Distribution of this procedure in Brazil from 2008 to 2018 showed predominance in the Southeast, Northeast and South regions, which together accounted for 87% of the total hospitalizations. The Southeast region concentrated the largest number of performed procedures (8,761), 37% of the total for the country in the period, with an annual average of 796 surgeries, followed by the Northeast region with 8,358 procedures, 35%, the South and North regions with 3491 and 1811 procedures, 15% and 8%, and the Midwest region with 1,181 surgeries, with an annual average of 107 procedures, 5%. The state of São Paulo presented the largest number of performed procedures during the period under analysis (4,786), with an annual average of 435, whereas



**Figure 2.** Total number of TDC excisions in Brazil from 2008 to 2018.

the state of Amapá showed the smallest number of performed procedures (75) in the period, with an annual average of seven surgeries.

The total cost for the Brazilian Unified Health System (SUS) with TDC excision in the period was BRL 11,604,754.30, with an annual average of BRL 1,054,977.66. The individual average value of each hospitalization was BRL 491.68. The average hospital length of stay for the procedure was 1.5 days. In the period described, there were 10 deaths resulting from the procedure, four of them in 2008 alone, with subsequent 1 to 2 deaths per year between 2009 and 2016, resulting in a mortality rate of 0.04% (Table 2).

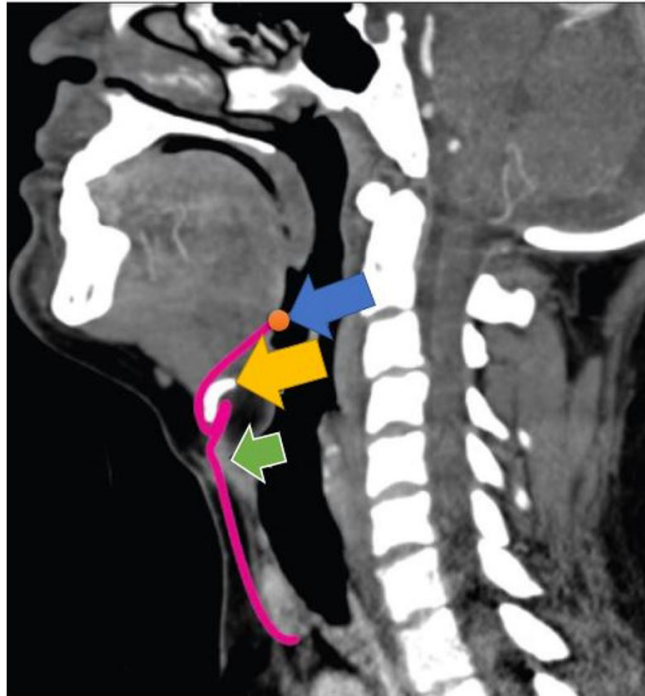
**Table 2.** Brazilian Panorama - TDC excisions performed by the SUS between 2008 and 2018.

Total Number of Surgeries	23,602
Annual Average Number of Surgeries	2,145
Procedures/100,000 inhabitants	11.85
Annual Cost (BRL)	1,054,977.66
Individual Average Value (BRL)	491.68
Average Hospital Length of Stay (days)	1.5
Mortality Rate (%)	0.04% (8 deaths)
Most Prevalent Region	Southeast (37%)
Least Prevalent Region	Midwest (5%)

### Literature analysis on TDC diagnosis

Analysis of the reviews published in the past decade reaffirms the importance of embryological knowledge for the proper diagnosis of thyroglossal duct cyst (TDC). Formation of TDC is due to persistence of the thyroglossal duct after the end of the descent of the thyroid gland, which originates from the base of the tongue, in the passing inside the hyoid bone, until is positioned

anterior to the trachea<sup>22</sup>. Its anatomical position is established on the seventh gestational week and the thyroglossal duct disappears on the tenth week. Persistence of a portion of the duct, with its epithelium, will result in a cystic lesion in the midline. Any part of the tract may persist after embryogenesis, resulting in the formation of TDC (Figure 3)<sup>52,53</sup>.



**Figure 3.** Sagittal section cervical Computed Tomography (CT) showing the anatomical pathway of the thyroglossal duct (pink line). The thyroid primordium (orange dot) originates from the foramen cecum (blue arrow). It descends anteriorly into the hyoid bone (yellow arrow) and descends anteriorly to the thyroid cartilage (green arrow) until it reaches the anatomical position of the thyroid gland. Any part of the tract may persist after embryogenesis, resulting in formation of TDC.

The literature indicates that the TDC is most frequently located under the hyoid bone (approximately 65% of cases). Suprahyoid TDCs are usually located in the midline, whereas infrahyoid TDCs are located in the paramedian region<sup>52</sup>. In some cases, there are areas of remnant thyroid tissue associated with malformation. There are cases of TDC carcinoma, with papillary carcinoma as the most frequent histological type, corresponding to 80% of the reported cases, followed by the follicular type, but prevalence of TDC-associated carcinoma is less than 1%<sup>17,35,54</sup>. Up to one third of patients present a history of recurrent cyst infections, with *Haemophilus influenzae*, *Staphylococcus aureus*, and *Staphylococcus epidermidis* as the most common pathogens<sup>55</sup>. In up to a quarter of the cases, cervical fistula with drainage of cyst contents may occur<sup>5,52</sup>.

The most recommended complementary examinations reported in the literature are cervical ultrasound (US) scan and thyroid stimulating hormone (TSH) test, which are important mainly to rule out ectopic thyroid tissue

because, although only 10% of ectopic thyroid cases are found in the neck, it can represent the only thyroid tissue in 75% of patients<sup>7,15</sup>. The US scan shows a well-defined, internally anechoic cyst representing cystic content<sup>37,43,56</sup>. If atypical manifestations such as calcifications, thick walls, internally isoechoic/hyperechoic nodules, or prominent adjacent vascularization are observed, additional imaging studies such as using computed tomography (CT) or magnetic resonance imaging (MRI) are required. CT will show a simple thin-walled hypoattenuating mass, whereas in MRI, the lesion will have a high T2 signal and a low-to-intermediate signal in T1-weighted images<sup>30,57</sup>.

Differential diagnosis of cervical malformations involve an array of diseases affecting the midline region, and the following congenital malformations are among the most important pointed out in the literature: ectopic thyroid tissue, branchial cleft cyst, dermoid cyst, thymic cyst, laryngocele, and lymphatic malformations. For differential diagnosis, attention should be focused on the adjacent structures and the internal architecture of the lesion during the imaging examination. The main points to differentiate between lesions are described ahead<sup>29,48</sup>.

*Gill cysts* are usually located along the anteromedial border of the sternocleidomastoid muscle, lateral to the carotid space and posterior to the margin of the submandibular gland. On imaging, there may be a “beak” sign characterizing the curved edge of the lesion that extends between the internal and external carotid arteries<sup>3,58</sup>:

Dermoid cysts are located in subcutaneous tissues, superficial to the musculature, usually near the suprasternal notch. The image may show calcifications or fat inside the cyst<sup>12,57</sup>.

Thymic cysts are closely associated with the carotid sheath, sometimes affecting the carotid artery and the jugular vein. On imaging, they present dumbbell or bilobed appearance, and may extend to the anterior mediastinum<sup>5,11</sup>.

Laryngocele has the main characteristic of being full of air or with fluid and air levels due to communication with the airways<sup>36,59</sup>.

Lymphatic malformations or head and neck lymphangiomas present fluid levels, usually from recent hemorrhage associated with transseptal lesions<sup>12,58</sup>.

### Literature analysis on TDC treatment

The literature indicates a surgical procedure known as the Sistrunk procedure, either classical or modified, is the standard treatment for TDC. Previously, high recurrence rates were observed after isolated cyst excision. In 1920, Sistrunk recommended block removal of tissue from the base of the tongue involving the entire duct, the cyst, and part of the hyoid bone. With this technique, the current recurrence rate is approximately 3%<sup>26</sup>. The main surgical objectives are to prevent cyst infection, avoid the rare possibility of neoplastic transformation, and for aesthetic purposes<sup>2,27</sup>. The literature recommends that infected cysts should be initially treated with antibiotic therapy before the surgical procedure. Draining of infected cysts should be avoided if possible in order to prevent the spread of ductal cells out of the cyst, which may increase the risk of cyst recurrence after surgery. Local seroma formation

and wound infections were the two most frequently observed complications in historical series; other complications such as hematoma, salivary fistula, hypothyroidism and airway stenosis have been rarely reported<sup>31,52</sup>.

## Discussion

The Brazilian panorama for thyroglossal duct cyst (TDC) shows that there is an annual prevalence of this condition operated by the public health network at almost constant levels and with relevant costs. The numbers for the investigated period indicate a prevalence higher than that reported in the international literature, considering that the national number of TDC excisions of the order of 11.85/100,000 inhabitants compared with those of some world series, which show an average of 2.2/100,000 inhabitants<sup>40</sup>. The largest number of procedures performed in the Southeast region indicate the concentration of health services as well as of the population in this region; however, it is worth noting that TDC excision is performed throughout the national territory by the public health system, which shows a maintenance this pathology, distributed nationwide, and alerts for the importance of knowing the appropriate diagnosis and therapy.

The literature is emphatic in mentioning that knowledge on the embryology of TDC is an important factor for the establishment of good propaedeutic, because malformations in the structures that form the cervical region are diverse and present confluent clinical practice. The clinical practice for TDC is well defined, and US scan, which is the standard for the initial evaluation, is widespread throughout the country, enabling more assertive diagnosis. However, situations such as recurrent infections, ectopic thyroid, and lymphatic malformations should be considered at the time of diagnosis because of their high prevalence, as well as the aforementioned differential diagnosis.

The recommended treatment for TDC is almost unanimous in the literature due to its efficacy and low complication rates and, mainly, to its low recurrence rates. The Sistrunk procedure has already been pointed out by metanalysis as the method of choice for the treatment of TDC. Alternative methods have been proposed, such as sclerotherapy with intracystic application of the OK-432 sclerosing agent, produced by lyophilization of the low virulent Su strain of *Streptococcus pyogenes*; as well as the use of ethanol, aiming at necrosis and later coagulation and cyst thrombosis, both discretely disseminated in medical practice, and thus with no data available for analysis<sup>13,31</sup>.

Limitations to this epidemiological study include the non-systematization and separation by SIH/DataSUS between sex and age groups of patients undergoing the procedures performed, as well as anatomical data regarding the topography of the affected cervical region and the number of post-surgery complications. This is a retrospective study conducted with secondary data in which patients were not randomized or compared. Another possible limitation is the data coding inaccuracies, as they were collected from the national public database, which depends on the information provided and may be underreported. The analysis of the reviews published in the past decade contributes to the outline of the diagnosis and management of TDC treatment overall; however, the analysis of the reviews presents methodological limitations because, ultimately, the references included will be narrative reviews and not of data, which reduces the strength of the analysis of evidence.



## Conclusions

The Brazilian panorama of thyroglossal duct cyst (TDC) management shows that this is a prevalent disease, with approximately constant rates during the period evaluated, with relevant annual costs to the SUS, and the Southeast region of the country as the main source of treatment for this condition. Assessment of anterior neck masses requires knowledge on the embryology of thyroid development for recognition of thyroglossal duct anomalies, just as it determines the anatomical relationships that establish the knowledge for differentiation from other cervical masses, along with imaging examinations such as US scan. Surgical treatment of TDC using the Sistrunk procedure is considered the method of choice, presenting small number of complications and low recurrence rates.

## References

1. Amos J, Shermetaro C. Cyst, thyroglossal duct [Internet]. Treasure Island (FL): McLaren Oakland Hospital, StatPearls Publishing; 2019. [cited 2019 Sep 30]. Available from: <http://europepmc.org/abstract/MED/30085599>
2. Oomen K, Modi V, Maddalozzo J. Thyroglossal duct cyst and ectopic thyroid. *Otolaryngol Clin North Am.* 2015;48:15-27.
3. Rosenberg TL, Brown JJ, Jefferson GD. Evaluating the adult patient with a neck mass. *Med Clin North Am.* 2010;94(5):1017-29. <http://dx.doi.org/10.1016/j.mcna.2010.05.007>. PMID:20736110.
4. Friedman ER, John SD. Imaging of pediatric neck masses. *Radiol Clin North Am.* 2011;49(4):617-32, v. <http://dx.doi.org/10.1016/j.rcl.2011.05.005>. PMID:21807165.
5. Ibrahim M, Hammoud K, Maheshwari M, Pandya A. Congenital cystic lesions of the head and neck. *Neuroimaging Clin N Am.* 2011;21(3):621-39, viii. <http://dx.doi.org/10.1016/j.nic.2011.05.006>. PMID:21807315.
6. Salgarelli AC, Robiony M, Consolo U, Collini M, Bellini P. Piezosurgery to perform hyoid bone osteotomies in thyroglossal duct cyst surgery. *J Craniofac Surg.* 2011;22(6):2272-4. <http://dx.doi.org/10.1097/SCS.0b013e318232788e>. PMID:22075832.
7. Sameer KSM, Mohanty S, Correa MMA, Das K. Lingual thyroglossal duct cysts—a review. *Int J Pediatr Otorhinolaryngol.* 2012;76(2):165-8. <http://dx.doi.org/10.1016/j.ijporl.2011.11.025>. PMID:22192899.
8. Catania VD, Manzoni C, Novello M, Lauriola L, Coli A. Unusual presentation of angiomatous hamartoma in an eight-month-old infant: case report and literature review. *BMC Pediatr.* 2012;12(1):172. <http://dx.doi.org/10.1186/1471-2431-12-172>. PMID:23130960.
9. Chou J, Walters A, Hage R, Zurada A, Michalak M, Tubbs RS, Loukas M. Thyroglossal duct cysts: anatomy, embryology and treatment. *Surg Radiol Anat.* 2013;35(10):35. <http://dx.doi.org/10.1007/s00276-013-1115-3>. PMID:23689821.
10. Gallagher TQ, Hartnick CJ. Thyroglossal duct cyst excision. *Adv Otorhinolaryngol.* 2012;73:66-9. <http://dx.doi.org/10.1159/000334308>. PMID:22472231.

11. Agarwal A, Kanekar S. Submandibular and sublingual spaces: diagnostic imaging and evaluation. *Otolaryngol Clin North Am.* 2012;45(6):1311-23. <http://dx.doi.org/10.1016/j.otc.2012.08.005>. PMID:23153751.
12. Goins MR, Beasley MS. Pediatric neck masses. *Oral Maxillofac Surg Clin North Am.* 2012;24(3):457-68. <http://dx.doi.org/10.1016/j.coms.2012.05.006>. PMID:22857718.
13. Kim M, Chung JH. Failure of sclerotherapy in the treatment of thyroglossal duct cyst in children: 2 case reports and review of the literature. *J Pediatr Surg.* 2012;47(9):e37-40. <http://dx.doi.org/10.1016/j.jpedsurg.2012.06.022>. PMID:22974634.
14. Bando H, Uchida M, Matsumoto S, Ushijima C, Dejima K. Endolaryngeal extension of thyroglossal duct cyst. *Auris Nasus Larynx.* 2012;39(2):220-3. <http://dx.doi.org/10.1016/j.anl.2011.04.008>. PMID:21621356.
15. Altay C, Erdoğan N, Karasu S, Uluç E, Sarsılmaz A, Mete B, Oyar O. CT and MRI findings of developmental abnormalities and ectopia varieties of thyroid gland. *Diagn Interv Radiol.* 2012;18(4):335-43. PMID:22328282.
16. LaRiviere CA, Waldhausen JHT. Congenital cervical cysts, sinuses, and fistulae in pediatric surgery. *Surg Clin North Am.* 2012;92(3):583-97, viii. <http://dx.doi.org/10.1016/j.suc.2012.03.015>. PMID:22595710.
17. Edwards R, Chapman T, Horn D, Paladin A, Iyer R. Imaging of pediatric floor of mouth lesions. *Pediatr Radiol.* 2013;43(5):43. <http://dx.doi.org/10.1007/s00247-013-2620-6>. PMID:23429804.
18. Pfeiffer M, Kim G, Krishnan M. Thyroglossal duct papillary carcinoma in a 15-year old female and review of pediatric cases of thyroglossal duct carcinoma. *Int J Pediatr Otorhinolaryngol.* 2014;78(1):78. <http://dx.doi.org/10.1016/j.ijporl.2013.10.013>. PMID:24238995.
19. Choi YM, Kim TY, Song DE, Hong SJ, Jang EK, Jeon MJ, Han JM, Kim WG, Shong YK, Kim WB. Papillary thyroid carcinoma arising from a thyroglossal duct cyst: a single institution experience. *Endocr J.* 2013;60(5):665-70. <http://dx.doi.org/10.1507/endocrj.EJ12-0366>. PMID:23318645.
20. Safiruddin F, Mourits DL, de Vries N. Thyroglossal duct cysts and obstructive sleep apnoea: three case reports and review of the literature. *J Laryngol Otol.* 2014;128(8):738-41. <http://dx.doi.org/10.1017/S0022215114001509>. PMID:25076215.
21. Curtis WJ, Edwards SP. Pediatric neck masses. *Atlas Oral Maxillofac Surg Clin North Am.* 2015;23(1):15-20. <http://dx.doi.org/10.1016/j.cxom.2014.10.002>. PMID:25707561.
22. Zander DA, Smoker WRK. Imaging of ectopic thyroid tissue and thyroglossal duct cysts. *Radiographics.* 2014;34(1):37-50. <http://dx.doi.org/10.1148/rg.341135055>. PMID:24428281.
23. Gaddikeri S, Vattoth S, Gaddikeri RS, Stuart R, Harrison K, Young D, Bhargava P. Congenital cystic neck masses: embryology and imaging appearances, with clinicopathological correlation. *Curr Probl Diagn Radiol.* 2014;43(2):55-67. <http://dx.doi.org/10.1067/j.cpradiol.2013.12.001>. PMID:24629659.

24. Carter Y, Yeutter N, Mazeh H. Thyroglossal duct remnant carcinoma: beyond the Sistrunk procedure. *Surg Oncol*. 2014;23(3):161-6. <http://dx.doi.org/10.1016/j.suronc.2014.07.002>. PMID:25056924.
25. Kim J-H. Ultrasound-guided sclerotherapy for benign non-thyroid cystic mass in the neck. *Ultrason (Seoul, Korea)*. 2014;33(2):83-90. <http://dx.doi.org/10.14366/usg.13026>. PMID:24936500.
26. Rohof D, Honings J, Theunisse HJ, Schutte HW, van den Hoogen FJA, van den Broek GB, Takes RP, Wijnen MH, Marres HA. Recurrences after thyroglossal duct cyst surgery: results in 207 consecutive cases and review of the literature. *Head Neck*. 2015;37(12):1699-704. <http://dx.doi.org/10.1002/hed.23817>. PMID:24985922.
27. Ibrahim F, Alnoury M, Varma N, Daniel S. Surgical management outcomes of recurrent thyroglossal duct cyst in children - a systematic review. *Int J Pediatr Otorhinolaryngol*. 2015;79(6):79. <http://dx.doi.org/10.1016/j.ijporl.2015.03.019>. PMID:25890397.
28. Huang L-D, Gao S-Q, Dai R-J, Chen D-D, He B, Shi H-Q, Yang K, Shan YF. Intra-thyroid thyroglossal duct cyst: a case report and review of literature. *Int J Clin Exp Pathol*. 2015;8(6):7229-33. PMID:26261619.
29. Hills SE, Maddalozzo J. Congenital lesions of epithelial origin. *Otolaryngol Clin North Am*. 2015;48(1):209-23. <http://dx.doi.org/10.1016/j.otc.2014.09.014>. PMID:25439555.
30. LaPlante JK, Pierson NS, Hedlund GL. Common pediatric head and neck congenital/developmental anomalies. *Radiol Clin North Am*. 2015;53(1):181-96. <http://dx.doi.org/10.1016/j.rcl.2014.09.006>. PMID:25476180.
31. Gioacchini FM, Alicandri-Ciufelli M, Kaleci S, Magliulo G, Presutti L, Re M. Clinical presentation and treatment outcomes of thyroglossal duct cysts: a systematic review. *Int J Oral Maxillofac Surg*. 2015;44(1):119-26. <http://dx.doi.org/10.1016/j.ijom.2014.07.007>. PMID:25132570.
32. Chala A, Álvarez A, Sanabria Á, Gaitán A. Carcinoma papilar primario en el quiste tirogloso. Serie de casos y revisión de la literatura. *Acta Otorrinolaringol Esp*. 2016;67(2):102-6. <http://dx.doi.org/10.1016/j.otorri.2015.04.002>. PMID:26277736.
33. Hong HS, Lee EH, Jeong SH, Park J, Lee H. Ultrasonography of various thyroid diseases in children and adolescents: a pictorial essay. *Korean J Radiol*. 2015;16(2):419-29. <http://dx.doi.org/10.3348/kjr.2015.16.2.419>. PMID:25741204.
34. Shah S, Kadakia S, Khorsandi A, Andersen A, Iacob C, Shin E. Squamous cell carcinoma in a thyroglossal duct cyst: a case report with review of the literature. *Am J Otolaryngol*. 2015;36(3):460-2. <http://dx.doi.org/10.1016/j.amjoto.2015.01.012>. PMID:25697085.
35. Bakkar S, Biricotti M, Stefanini G, Ambrosini C, Materazzi G, Miccoli P. The extent of surgery in thyroglossal cyst carcinoma. *Langenbecks Arch Surg*. 2017;402(5):799-804. PMID:27339199.
36. Ho M-L, Courtier J, Glastonbury CM. The ABCs (Airway, Blood Vessels, and Compartments) of pediatric neck infections and masses. *AJR Am J Roentgenol*. 2016;206(5):963-72. <http://dx.doi.org/10.2214/AJR.15.15812>. PMID:26959095.

37. Brown RE, Harave S. Diagnostic imaging of benign and malignant neck masses in children-a pictorial review. *Quant Imaging Med Surg.* 2016;6(5):591-604. <http://dx.doi.org/10.21037/qims.2016.10.10>. PMID:27942480.
38. Christison-Lagay E. Complications in head and neck surgery. *Semin Pediatr Surg.* 2016;25(6):338-46. <http://dx.doi.org/10.1053/j.sempedsurg.2016.10.007>. PMID:27989359.
39. Sturniolo G, Vermiglio F, Moleti M. Thyroid cancer in lingual thyroid and thyroglossal duct cyst. *Endocrinol Diabetes Nutr.* 2017;64(1):40-3. <http://dx.doi.org/10.1016/j.endonu.2016.07.010>. PMID:27825535.
40. Thompson LDR. Thyroglossal duct cyst. *Ear Nose Throat J.* 2017;96(2):54-5. <http://dx.doi.org/10.1177/014556131709600204>. PMID:28231361.
41. Nightingale M. Midline cervical swellings: what a paediatrician needs to know. *J Paediatr Child Health.* 2017;53(11):1086-90. <http://dx.doi.org/10.1111/jpc.13759>. PMID:29148189.
42. Thompson LDR, Herrera HB, Lau SK. Thyroglossal duct cyst carcinomas in pediatric patients: report of two cases with a comprehensive literature review. *Head Neck Pathol.* 2017;11(4):442-9. <http://dx.doi.org/10.1007/s12105-017-0807-0>. PMID:28293858.
43. Frank SJ, Koenigsberg T, Gutman D, Koenigsberg M. Applications of 3-dimensional ultrasonography in the neck, excluding the thyroid. *J Ultrasound Med.* 2018;37(7):1791-806. <http://dx.doi.org/10.1002/jum.14514>. PMID:29288583.
44. Rayess HM, Monk I, Svider PF, Gupta A, Raza SN, Lin H-S. Thyroglossal duct cyst carcinoma: a systematic review of clinical features and outcomes. *Otolaryngol Head Neck Surg.* 2017;156(5):794-802. <http://dx.doi.org/10.1177/0194599817696504>. PMID:28322121.
45. Alatsakis M, Drogouti M, Tsompanidou C, Katsourakis A, Chatzis I. Invasive thyroglossal duct cyst papillary carcinoma: a case report and review of the literature. *Am J Case Rep.* 2018;19:757-62. <http://dx.doi.org/10.12659/AJCR.907313>. PMID:29950556.
46. Bansal AG, Oudsema R, Masseaux JA, Rosenberg HK. US of pediatric superficial masses of the head and neck. *Radiographics.* 2018;38(4):1239-63. <http://dx.doi.org/10.1148/rg.2018170165>. PMID:29995618.
47. Quintanilla-Dieck L, Penn EB Jr. Congenital neck masses. *Clin Perinatol.* 2018;45(4):769-85. <http://dx.doi.org/10.1016/j.clp.2018.07.012>. PMID:30396417.
48. Patel S, Bhatt AA. Thyroglossal duct pathology and mimics. *Insights Imaging.* 2019;10(1):12. <http://dx.doi.org/10.1186/s13244-019-0694-x>. PMID:30725193.
49. Hosokawa T, Takahashi H, Miyasaka Y, Ohira K, Tanami Y, Sato Y, Ishimaru T, Kawashima H, Hosokawa M, Oguma E, Yamada Y. Ultrasound evaluation of dermal sinuses/fistulas in pediatric patients. *J Ultrasound Med.* 2019;38(12):3107-22. <http://dx.doi.org/10.1002/jum.15016>. PMID:31063247.
50. Korbi AE, Houas J, Bouatay R, Harrathi K, Koubaa J. Primary papillary carcinoma of the thyroglossal duct in a 14-year-old female: case report and review of the literature. *Pan Afr Med J.* 2019;32:121. <http://dx.doi.org/10.11604/pamj.2019.32.121.15246>. PMID:31223411.

**\*Correspondence**

Ricardo Vieira Teles Filho  
Universidade Federal de Goiás  
(UFG), Faculdade de Medicina,  
Departamento de Cirurgia  
Av. dos Alpes, Quadra 49, Lote 11,  
Setor União  
CEP 74313-760, Goiânia, (GO) Brasil  
Tel.: +55 (062) 98414-1047  
E-mail: ricardovteles@gmail.com

**Author information**

RVTF - Member, Colégio Brasileiro  
de Cirurgiões (CBC), Faculdade de  
Medicina, Departamento de Cirurgia,  
Universidade Federal de Goiás (UFG).

51. Instituto Brasileiro de Geografia e Estatística [Internet]. População. Rio de Janeiro: IBGE; 2019 [cited 2019 June 8]. Available from: <https://www.ibge.gov.br/estatisticas/sociais/populacao.html>
52. Foley DS, Fallat ME. Thyroglossal duct and other congenital midline cervical anomalies. *Semin Pediatr Surg.* 2006;15(2):70-5. <http://dx.doi.org/10.1053/j.sempedsurg.2006.02.003>. PMID:16616309.
53. Sadler TW. *Langman's medical embryology*. 5th ed. Baltimore: Williams and Wilkins; 1985. p. 292-295.
54. Glastonbury CM, Davidson HC, Haller JR, Harnsberger HR. The CT and MR imaging features of carcinoma arising in thyroglossal duct remnants. *AJNR Am J Neuroradiol.* 2000;21(4):770-4. PMID:10782794.
55. Solomon JR, Rangecroft L. Thyroglossal-duct lesions in childhood. *J Pediatr Surg.* 1984;19(5):555-61. [http://dx.doi.org/10.1016/S0022-3468\(84\)80103-7](http://dx.doi.org/10.1016/S0022-3468(84)80103-7). PMID:6502427.
56. Imhof H, Czerny C, Hörmann M, Krestan C. Tumors and tumor-like lesions of the neck: from childhood to adult. *Eur Radiol Suppl.* 2004;14(4, Suppl 4):L155-65. <http://dx.doi.org/10.1007/s00330-003-2035-0>. PMID:14752572.
57. Fang WS, Wiggins RH 3rd, Illner A, Hamilton BE, Hedlund GL, Hunt JP, Harnsberger HR. Primary lesions of the root of the tongue. *Radiographics.* 2011;31(7):1907-22. <http://dx.doi.org/10.1148/rg.317095738>. PMID:22084179.
58. Loevner LA. Imaging of the thyroid gland. *Semin Ultrasound CT MR.* 1996;17(6):539-62. [http://dx.doi.org/10.1016/S0887-2171\(96\)90003-7](http://dx.doi.org/10.1016/S0887-2171(96)90003-7). PMID:9023867.
59. Mittal M, Malik A, Sureka B, Thukral B. Cystic masses of neck: a pictorial review. *Indian J Radiol Imaging.* 2012;22(4):334-43. <http://dx.doi.org/10.4103/0971-3026.111488>. PMID:23833426.